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How did the Wolf crater complex form on the Moon?

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The Wolf crater complex located at 16.573° W and 22.904° S, near the centre of Mare Nubium, is a lunar silicic construct. In this study, high-resolution compositional and morphological analysis of the Wolf crater complex was done using data from the Moon Mineralogy Mapper (M^3) instrument onboard the Chandrayaan-1 mission, the Multi-band Imager (MI) and Terrain Camera (TC) onboard the Kaguya mission, the Lunar Orbiter and Laser Altimeter (LOLA), Narrow Angle Camera (NAC) and Wide Angle Camera (WAC) onboard the Lunar Reconnaissance Orbiter (LRO) mission, and gravity data from the Gravity Recovery and Interior Laboratory (GRAIL) mission. Using these data and the Crater-Size Frequency Distribution (CSFD) technique, the Wolf crater complex is interpreted to be a collapsed felsic volcanic caldera where silicic volcanism occurred between ~3.7-3.6 Ga, with episodic mafic volcanism continuing till ~1.7 Ga. Mineralogical analyses reveal the presence of low-Ca pyroxenes and Mg-spinel bearing exposures within the silicic complex. Coupled with CSFD results, these analyses indicate that mare basalts occupying the central depression of the complex were generated in situ and were not transported from the surrounding mare units, indicating prolonged magmatism in this part of Mare Nubium. Gravity studies also reveal high-density anomalies (mafic intrusions) surrounding the low density (silicic) Wolf crater complex. M^3 reflectance spectra from this complex show no hydration feature. Inferred compositions of pyroxenes from non-mare regions of the complex do not show the extreme iron enrichment expected in silicic melts formed in association with highly Fe-rich liquid counterparts, negating silicic melt derivation from silicate-liquid immiscibility. More likely, crustal melting triggered by mafic intrusions may have generated felsic melts in the Wolf volcanic complex. Troctolites or alkali gabbronorites represent possible crustal protoliths for such melts. Structural controls imposed by regional stress regimes, partly manifested by wrinkle ridges, may have played a major role in the formation and subsequent collapse of the Wolf volcanic structure. These results are integrated to propose a holistic model for the evolution of the Wolf crater complex, with implications for the origin of early, anhydrous silicic lithologies on the Moon and terrestrial planets.